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LAND RELIEFS THAT ARE TRUE TO NATURE

BY

GEORGE CARROLL CURTIS

The earth sciences have at present scarcely any accurate models of land forms corresponding with our museum specimens of plants and animals, although such models could render great service to geology and geography. The "natural history specimen" in geography is evidently the actual land itself as it exists in the field, be it mountain, glacier, or other form of the Earth's surface. By rational procedure the magnitude of the natural form can be reduced, and the scaling down of the vast dimensions to a size that can be conceived at a glance, brings it within a compass which can best be appreciated by human senses. Thus the characteristic forms of topography may become comprehensible in their details to the inexpert, and more thoroughly known by the specialist.

The naturalistic land model is a true reproduction of the existing outdoor form. It is both a true duplication as to surface and a faithful representation of the appearance and character of the object as it stands in the open. This implies that the model must reproduce, according to the scale of the work, not only the natural form of the land, but also represent the coloring and natural expression of the field as, under the time and conditions, it is depicted in the work. In theory, land models made on the naturalistic principle, *i. e.,* the reproduction of form and coloration as it exists, would reproduce the appearance of the natural phenomena taken; this is indeed the province and the test of the geographic model and its accuracy may be checked and proven by this comparison. This truthful reproduction may be called a picture in relief for it shows in three dimensions what photographs and paintings of topography present in two. It gives moreover not only the single view from one point which painting and photography supply, but vistas from an infinite number of positions as well. All topography in the field is much distorted by perspective, but the reduced model presents it in the least deflected presentation.

We have not been accustomed to see in our museums and laboratories, reliefs of land forms which afford true pictures of existing landscape; yet that these may at least be approximated has been demonstrated in Europe by the Matterhorn model produced by Imfeldt of the Heim school and exhibited at Paris in 1900, and the Bora Bora coral island model produced in this country in 1907 and installed in the Agassiz Museum.

The advent of the naturalistic model during the past decade presages a happy achievement for geography. It seems probable that it may hold for this study an interest similar to that which museum specimens of plants and animals have brought to biological subjects. It has the advantage of suggesting natural scenery, wears a convincing aspect of truth, and imparts a more comprehensive and exact idea of the thing represented than can be given in any other way. The full bearing of such advantage as the naturalistic land model may give is not yet recognized, yet its general use may give a distinct impetus to the specific understanding and teaching of earth sciences.

As the naturalistic model has a part so important and interesting, especially in Geography, in creating a broader interest and clearer understanding let us inquire why so valuable a means did not long ago come into common use and why museums and schools in general have not become familiar with such equipment.

In the modern, better understanding of geographic forms, to which the American geographers, Powell, Dutton, Russell, Gilbert and Davis have so much contributed, and in the perfecting of dry plate photography lie two of the most potent influences without which the art of reproducing the forms of the earth in relief could not have reached its present position, even though it has, as yet, scarcely crossed the threshold of its development. The "raising up" of maps into relief has been the common conventional procedure in land relief work, but the naturalistic motif aims to reproduce nature. Simple as is this distinction, there is a large difference in the data required, in the work necessary, and in the conception of the subject involved, and there is a corresponding dissimilarity in results. The naturalistic model approaches in truth the field itself with the advantage of comprehensible size. The first fine map of Switzerland, a country which has been foremost in such work, was made from a modelled relief of the land.

There are found in the raised maps or conventional representations, any kind of exaggeration the maker may wish to introduce for his special purpose. He may put in or eliminate what he chooses, change vertical and horizontal scales, print names and spangle with barbarous colors; this being consistent with the diagram and the flat or the raised map. Not so with the naturalistic model; no such liberties can be taken; it is arbitrary and must reproduce the special place on the earth as it exists and appears. The purpose of this work is general not special, direct and exact not optional.

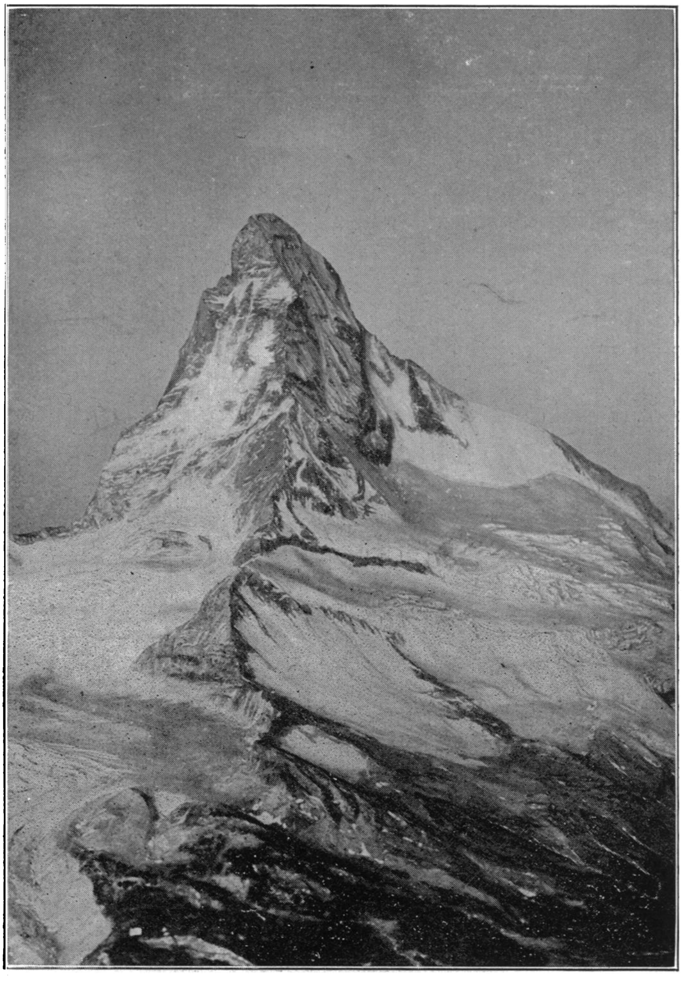

Fig. 1—A Naturalistic Model of the Matterhorn. By Imfeldt. (Heim School) Switzerland.

In discussing the naturalistic model, it is not necessary to include the raised map, but as this, the most superficial expression of the subject, has constituted the bulk of the work, so that the prevailing ideas have been largely derived from it, a clearer understanding may be had from a brief comparison of the two classes. When a recognition of the difference of principle is gained, it is seen that one product involves merely mechanical execution, while the other involves the application of principles of rational interpretation of natural phenomena themselves as guide to every phase of execution. There is a mechanical element in both scientific and artistic work which is ever likely to be confused with the principles which may create it. This detail is liable to seem the more obvious part and is frequently the first thing noticed while the principles which have guided the hand of a master and perhaps unconsciously produced the technique, though the essence of the matter, are often overlooked.

The mechanical details of writing a treatise on natural topography are no more its essential part than the mechanical details which go to build up an expressive topographic relief; in each they are but the means to accomplish an end. The French military service has a routing machine which turns flat maps into raised maps, but no machine except a reasoning one can reproduce the expressive surface of the earth in its characteristic appearances. It may be added that no one but a thorough portrait artist can adequately represent the human countenance, and that a competent geographical artist is requisite truthfully to reproduce the complicated natural surface of the lands. Some arts have more mechanical detail than others, as drawing more than writing and modelling more than drawing. The principles which must govern all rational work in land relief have been overlooked by many because of this profusion of mechanical detail required in their execution.

It may seem strange that a work which can present the forms of the earth in the truest possible way should as yet be so little understood. One consideration however is the peculiar position which it occupies; it is one of the "borderland" subjects, lying between the earth sciences on one hand and the landscape arts on the other. The artist who has today a geologic training is very rare, and the work involved in reproducing landscape in its natural three dimensions is so much greater than on a flat surface by painting, that landscape painters would not likely venture far into it; on the other hand, the modern earth scientist has rarely a sound training in the fine arts and is apt to be unreceptive of the requisite artistic appreciation which may reach the intuitive mind. Thus this broad subject involving the application of science and art, with a knowledge of geology, painting and sculpture, has lain in an unprogressive eddy between the busy streams of their activities.

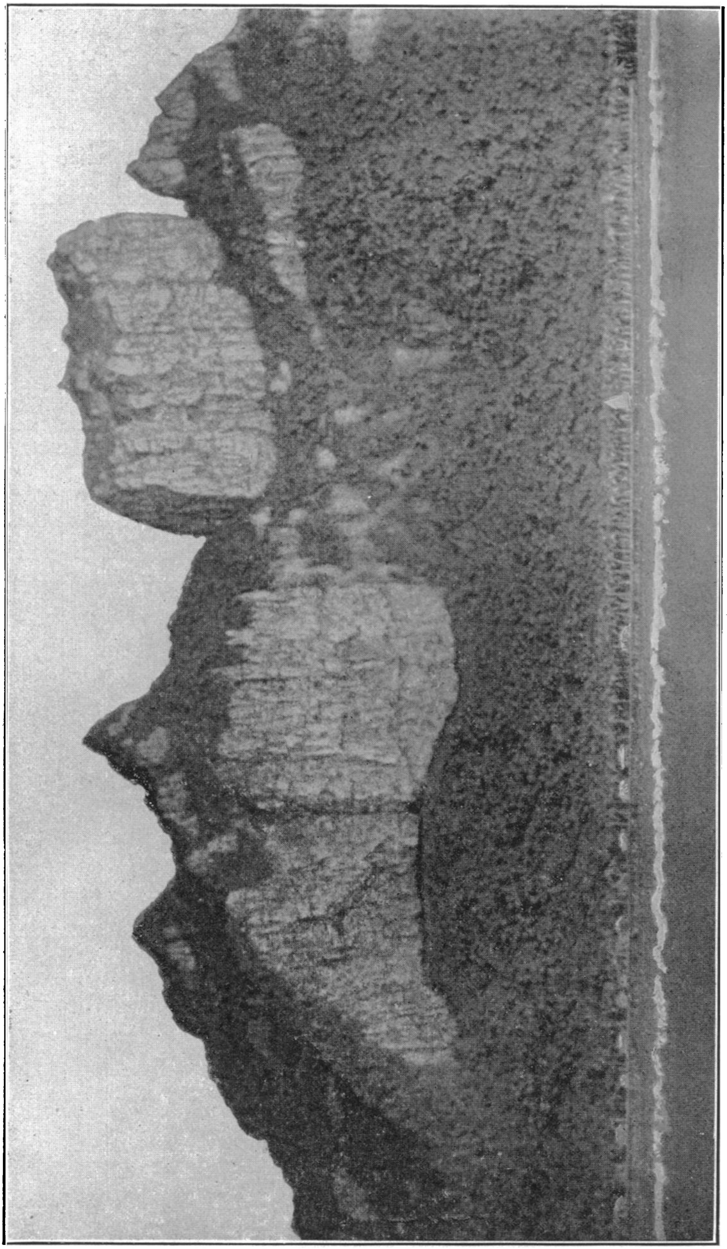

Fig. 2—Photograph of central portion Bora Bora Model. Showing central volcanic peaks, precipitous slopes crowded with tropic vegetation, narrow coastal plain with coconuts and native houses, sail in main lagoon. In foreground, sea breaking on the barrier coral reef.

It is the man with interests in both science and art who has helped most in advancing the subject of earth relief work. Albert Heim, leading geologist of Switzerland, artist by inclination and training, might be called the father of modern land relief modeling. In this country the geologist-artist combination produced the unequaled drawings of Western America topography of Prof. W. H. Holmes. Dr. R. T. McKenzie, a physician-artist, has added a new interest and knowledge to sculpture and anatomy in the naturalistic representation of the modern college athlete. In the naturalistic representation of animal and bird groups the artist-naturalists of the American Museum of Natural History, have brought a new and vivid presentation of the life and habitat of American fauna which has drawn a broader interest than museums of natural history have before been able to attract.

The past recalls as men of the artist-scientist type, Leonardo da Vinci, John Ruskin, Charles Eliot and Augustus Saint-Gaudens.

A comparison of the processes of making a raised map and a naturalistic land model should help those who are accustomed to consider a topographic relief as a matter of process and mechanical method alone, and not of principle, (the rational interpretation of natural earth phenomena in relief), to see the wide difference in procedure.

In 1904, Alexander Agassiz decided to have reproduced in relief, the coral island Bora Bora of the Society Archipelago.* The model was to reproduce the surface of the island as it exists in form, color and appearance, *i. e.*, it was to be "naturalistic." Fairly good maps made by the French Government were at hand and these gave sufficient data to prepare a raised map which indeed might have been forthwith constructed, and results similar to those of the common kind of work speedily turned out. It was recognized that such a procedure would give not more but less truth than was already possessed, and if a true model were to be made, the necessary data for it must be procured. This little coral island was visited, two months of field work were spent upon it, and all the data requisite to reproduce both form and color of the natural field were collected. The work included a complete photographic survey, covering every point of the surface from at least two separate stations. The data collected were brought back and incorporated into a relief (about 100 square feet in area). When views of the modeling, duplicated those made in the field from identical points, the sculpturing of the land forms was regarded as finished.

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* This island was chosen by Darwin (" Structure and Distribution of Coral Reefs," p. 3) to illustrate the type of high island with volcanic center surrounded by coral reef and inclosing a vegetation covered land rim.

Duplicating the forms did not complete the naturalistic representation of the island. The coloration of rocks, bare and grassy slopes, trees and other vegetation, roads, beaches, reefs, etc., had been taken, and an attempt was made to carry out a naturalistic system of coloring which should give the season, time, and general conditions represented, in accordance with the recognized laws of color and principles of art. The entire face of the land was modeled as a portrait statue of the human figure would be produced by a figure sculpture. Several specially trained workers were placed on the purely mechanical parts, the construction taking over a year of steady labor.

A raised map of the same size and scale of the ordinary standard could have been completed in seven weeks, and without other aid than unskilled labor. A slab of plaster with the contour lines of the map drawn upon it, could have been cut down by a routing machine, the signs of the map painted upon the resulting relief, and the raised map would be complete. Inadequate as works from such a basis are and appear to be when such principles are applied to other natural objects than the forms of the lands, they nevertheless have been in common use as geographic reliefs.

That the more rational methods used in the coral island work* should produce a different class of work and a product quite dissimilar in appearance, was to be expected. At first glance a casual observer would mark a difference. People who had never seen a naturalistic land model were surprised to discover a topographic relief that gave the appearance of something they had seen out of doors. When they compared the modeled forms with photographs of the field, they saw that the artistically made shapes were like the natural features and being first attracted by the appearance of naturalness, then interested by the accuracy proven, they became impressed with the truth of the model finding in it reliability that had not hitherto been expected from this medium of earth representation. A glance at the naturalistic work gave even to Professor Agassiz a more complete understanding of the island than was before possible and to all who had never seen a coral atoll, the model gave the best opportunity for seeing what it is. The value of the naturalistic model to Geology, Geography and Museums of Natural History was demonstrated and those who gave it thought saw how much clearer and more specific our preceptions of the forms of the earth will be when eventually we have its principal types reproduced in true naturalistic models.

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* The paucity of naturalistic land reliefs on exhibition in this country makes this reference necessary.

If our museums and collections had never possessed naturalistic specimens of plants and animals, what would be our perception of the fauna and flora of the world? The naturalistic land model is to Geography what the natural animal specimen is to Zoölogy, and it has even a greater service, for outside the museum we may view many animals at close range, but the types of land forms are so vast that in the field our limits of vision will permit the examination of but a small part at a time.

The development of the art of land representation in relief has been retarded by the peculiar conditions surrounding it. The art of earth sculpture is akin to that of figure sculpture, both of which are parts of a large subject, including the representation in relief, of the earth and its forms both organic and inorganic. The division of the inorganic which includes the sculpture of the lands, is subject to the same laws as that of the organic which includes the human figure and the sculpturing of animals. Again, the reproduction of portions of the Earth's surface, forms and coloration in relief, is a representation of the same landscapes in three dimensions which painters represent with colors and canvas in two dimensions. The same general laws of science and art apply to reliefs of the land as to the sculpturing of the human figure, and the painting of natural landscapes. That each portion of the land's surface gives a definite problem in natural history whose proper solution in relief must be obtained through consistently following the development of science and laws of art appears to have been largely overlooked.

To understand the principles of earth sculpture one must be familiar with the earth science on which it depends as the figure sculptor must know human anatomy the basis of figure reproduction; moreover as successful painting and sculpture are guided by the laws and rules of good art, so a knowledge of these same rules and laws must guide the understanding and practice of the art of representing the lands in relief. It is a subject with a dual basis of art and science. As with Paleobotany both geology and botany must be studied, so in topographic modeling adequate work or criticism must be based on the fine arts as well as earth science. While this combination has been quite rare in individuals, in groups whether of artists on the one hand or scientists on the other it has been wholly wanting, and little or no concerted action to forward this work has been taken. Artists being largely unacquainted with the scientific aspect have passed it by, and the average man in earth science had small interest in the artistic basis.

What development the work of faithful reproduction of the forms of our Earth has attained has come mostly through the support of men with interests on both sides of the dual subject, men of both scientific training and artistic appreciation. Among those engaged in earth science in Europe, Heim and his pupil Imfeldt of Zürich, and Schrader of Paris have done most by their own work while in America, Agassiz, McKim, Saint-Gaudens, Burnham and Olmsted, men of both scientific and artistic training, have, from the point of view of dual relation, recognized the unequalled value of the naturalistic land model to aid in their special activities and have lent support and encouragement to its promotion. When we realize that until within the last five years, there have been in American institutions (with the possible exception of some small idealistic reliefs by Prof. Heim) few if any naturalistic topographic models, it is not strange that there are still men eminent in the earth sciences, who do not yet clearly distinguish between the principle of the naturalistic land model and the raised map.

In the interest of more specific and wide spread appreciation of geographic forms and types, it is unfortunate that the smaller side of the broad subject of earth sculpture has alone been generally recognized. An impression that process, addition or suppression of mechanical details is all there can be in the subject has been widely spread. One conversant with art in any form, be it in letters, music, painting or other means of expressing natural truth, may see the fallacy of such a conception, for in all arts which interpret nature, method is but a means to accomplish a purpose.

When a master sculptor chisels the human form, his knowledge and fine perception of the subject show in the handiwork, they guide the mechanical steps of execution and may produce even without design, a certain technique; these cuttings, skillful contrivances, humps, hollows and processes are not in themselves the important part, but merely the mediums through which ideas are expressed.

No mechanic who can see only the details and processes of construction, (these must always differ according to the infinitely varied problems which natural topography and scenery present), has the knowledge and perception to ever produce a good piece of naturalistic art of whatsoever sort, lacking as he does the ability to see that which the well trained mind of the artist grasps as essential. Nor can the scientist untrained and unversed in artistry rightly expect to achieve successful results in this medium of naturalistic expression. To accept as adequate in earth sculpture results that would be universally unacceptable in figure sculpture is inconsistent with the aspect of the surface of our planet as it appears to men of scientific training and vision. To produce results in land modeling equal to those of good figure sculpture, it is necessary to employ knowledge, training and perception of comparable quality.

One of the first functions of the naturalistic geographical model is to correct the false impressions of slope and relief which most of the old raised maps have given us. Many leading teachers today seem unable to recognize truthfully modeled land slopes when they are so represented, holding from old association that they must be too steep or very inexact. As yet, largely for lack of true models, they have not become accustomed to expect in earth reliefs reliability and true reproduction of natural form. Gradually the naturalistic model may rectify false impressions; and the doubting spectator, by comparing the model with photographs of the field can satisfy himself of the reliability of the medium.

Without such reliefs the teacher of Geography lacks the most comprehensive, truthful and convincing means of conveying the facts of earth forms.*

A far wider and keener interest will be attracted to the earth sciences as a logical result of applying to the intricate forms of natural landscape, the same degree of knowledge, study and training that is already applied to the well-known naturalistic arts.

Until our museums possess naturalistic specimens of existing types of land forms a most important work and duty in the earth sciences will remain undone and we shall be without the most complete and effective means known for presenting the great features of Geography with their splendid forms of mountain scenery and various types of landscape.

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* As yet naturalistic geographical models have not been commonly adopted in schools, though their possible service in imparting a vital and truthful interest to the study is probably enormous. Teachers have not yet been trained in their use and value, and it is only within the past few years that such apparatus has been placed within reach of the common schools.